Q. P. Code: 20935

Time:	2½ ľ	nours	37

Total Marks: 75

- N. B.: (1) All questions are compulsory.
 - (2) Make <u>suitable assumptions</u> wherever necessary and <u>state the assumptions</u> made.
 - (3) Answers to the same question must be written together.
 - (4) Numbers to the **right** indicate **marks**.
 - (5) Draw neat labeled diagrams wherever necessary.

1. Attempt *any three* of the following:

15

- a. What is data structure? Explain the categories in which data structure can be divided.
- b. What is an algorithm? What are the characteristics of an algorithm?
- c. What is meant by complexity of an algorithm? Explain different types of complexities.
- d. Write an algorithm to insert an element into the array and to delete an element from the array.
- e. What is bubble sort? Sort the following data items using bubble sort method. 14, 33, 27, 35, 10
- f. What are the advantages and limitations of an array?

2. Attempt *any three* of the following:

15

- a. What is linked list? Write and explain an algorithm to insert an element at the beginning of the singly linked list.
- b. Write and explain an algorithm to split a link list into two linked lists.
- c. What is circular linked list? How to traverse a circular linked list?
- d. What is the need of two way linked lists? Explain the structure of a node in a two way linked list.
- e. Write a short note on header linked list.
- f. Explain how to represent a sparse array using an array and a linked list with an example.

3. Attempt *any three* of the following:

15

- a. Define stack. Discuss the basic operations performed on the stack. Also explain overflow and underflow conditions of the stack.
- b. Write an algorithm to implement the stack operations using an array.
- c. Convert the following expressions in postfix and prefix notations.

(i)
$$I_{in} = (x - y) \times ((z + v) / f)$$

(ii)
$$I_{in} = (x * y) + (z + ((a + b - c) * d)) - I * (j/k)$$

- d. Define queue. How queue is represented in memory using linked list?
- e. Write a short note on double ended priority queue.
- f. Write an algorithm to insert and delete a node from a circular queue.

4. Attempt <u>any three</u> of the following:

15

- a. Reconstruct the binary tree whose in-order and pre-order traversals are: In-order Traversal : g d b h e i a f c Preorder Traversal: a b d g e h i c f
- b. What is binary search tree? Write an algorithm to find the position of a given element 'Item' and its parent in a binary search tree.

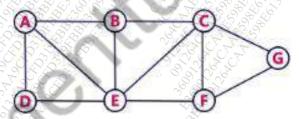
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- c. Sort the following data elements using heap sort algorithm. 22, 35, 17, 8, 13, 44, 5, 28
- d. What is AVL tree? How balancing is done in AVL tree? Explain with example.
- e. What are 2-3 trees? How to delete a key value from 2-3 trees?
- f. What are the algorithmic steps of insertion sort method? Sort the following data elements using insertion sort method.
 7, 8, 5, 2, 4, 6, 3

5. Attempt *any three* of the following:

- a. What is hashing? Explain mid square method and division remainder method of calculating address.
- b. Describe the following collision resolution techniques.
 - (I) Linear probing
 - (II) Chaining
- c. Define the following terms.
 - 1. Graph
 - 2. Outdegree and Indegree
 - 3. Source and sink
 - 4. Path
 - 5. Strongly connected graph
- d. Traverse the following graph using Depth First Search traversal technique. Start traversing from the source vertex 'A'.



- e. Explain Warshall's algorithm of finding path matrix of a graph.
- f. Find the minimum spanning tree for the following graph using Prim's algorithm and the source vertex 'S'.

